RWD84

Real-world Assessment of Opioid and Health Economic Outcomes in Medicare Advantage Beneficiaries Undergoing Total Shoulder Arthroplasty

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OBJECTIVES

Although total shoulder arthroplasty (TSA) procedures have been increasingly performed in outpatient care settings, little is known about the impact of postsurgical analgesia on clinical and economic outcomes after TSA. This study assessed use of liposomal bupivacaine (LB), a long-acting local anesthetic, in relation to outcomes of total healthcare cost and opioid intake over 90 days after TSA in a hospital outpatient setting in patients with no prior opioid exposure.

CONCLUSIONS

1. LB use in outpatient TSA was associated with lower total episode-of-care costs at 30 days and 90 days of follow-up since surgery and lower total skilled nursing facility (SNF) costs at 30 days of follow-up
2. LB use was also associated with lower opioid intake over 90 days of follow-up in opioid-naive patients and fewer opioid-related adverse events (ORAEs) at 60 days and 90 days of follow-up
3. Our results suggest a benefit of LB use as part of postsurgical pain management

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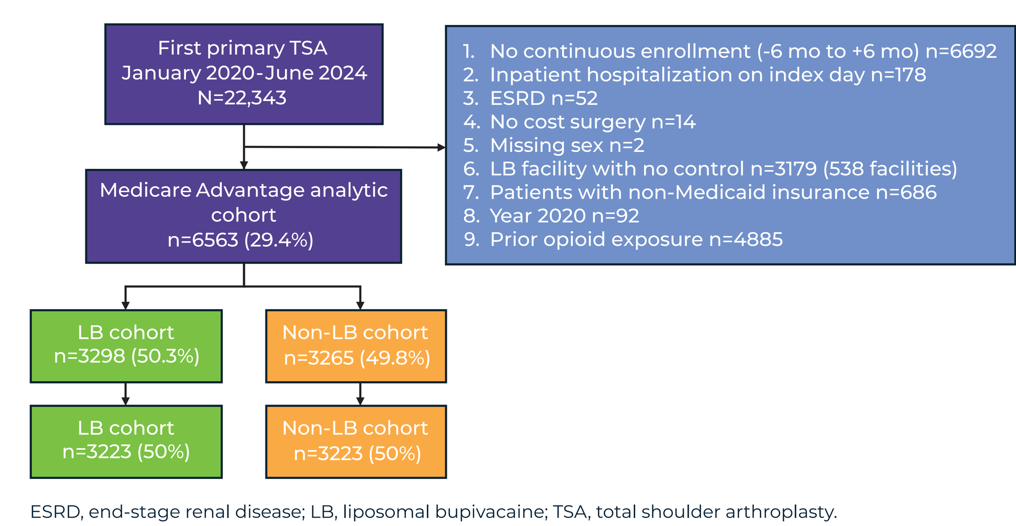
INTRODUCTION

- TSA has rapidly increased in the United States from 2010 to 2020, with a projected estimate of >170,000 procedures performed in 2025[1]
  - The increasing prevalence is due to expanded indications for TSA, the aging population, and high demand from relatively young patients[2,3]
- Advances in surgical technique and postoperative care have accelerated the migration of TSA to outpatient ambulatory surgical centers (ASCs), providing a cost-effective alternative to inpatient procedures for select patients[4,5]
  - The 2021 Medicare policy expansion allowing outpatient TSA contributed to a >400% increase in ambulatory procedures[5]; notably, migration of various procedures to ASC-based settings has been associated with cost savings of up to 43% compared with traditional hospital settings[6]
- Effective perioperative pain management is critical to optimize clinical outcomes and reduce healthcare utilization and costs following shoulder surgery[7-10]
- Recent initiatives, including the NOPAIN Act and Centers for Medicare and Medicaid Services episode-based care initiatives, have intensified the focus on nonopioid pain strategies[11]
  - However, despite the shift toward nonopioid pain management, reimbursement barriers may result in the selection of opioids over other analgesic options; this carries the potential for detrimental outcomes,[12] given that 6% to 40% of patients engage in long-term opioid use ≤1 year since surgery[11]
- LB is a nonopioid treatment that has been associated with improved outcomes, reduced costs, and decreased opioid consumption compared with other analgesic or control modalities in patients undergoing TSA[13-22]
  - However, there are limited real-world data regarding the impact of LB use for outpatient TSA in Medicare Advantage beneficiaries (or patients covered by Medicare Advantage health plan)

METHODS

- This retrospective cohort study included patients from the Optum Clinformatics® database (2019-2024) who underwent outpatient TSA (CPT code: 23472) from January 2020 to June 2024
- Of the 22,343 patients included, this study analyzed 6563 patients with no prior opioid exposure (ie, opioid naive), with insurance through a Medicare Advantage plan, with ≥6 months continuous enrollment before/after TSA, and who had received TSA with and without LB use in hospital outpatient department settings (Figure 1)
- Patients received either postsurgical LB (n=3298) or standard of care options (non-LB; n=3265)
- Propensity scoring was used to match LB with non-LB patients (1:1) by these 12 covariates: age, sex, race, obesity, smoking, dementia, depression, anxiety, chronic pain, substance use disorder, surgical year, and Quan-Charlson Comorbidity Index
- Study outcomes were assessed over 30, 60, and 90 days of follow-up after surgery
  - Healthcare costs included medical costs (emergency department, inpatient, outpatient, and SNF costs)
  - Opioid intake was measured in morphine milligram equivalents (MMEs)
- Outcome comparison was performed using generalized linear regression modeling with adjustment for age, region, and log-transformed provider volume of TSA, assuming gamma distribution for costs, Tweedie distribution for opioid intake (MMEs), and binomial distribution for ORAEs

Figure 1. Medicare Advantage analytic cohort.



ESRD, end-stage renal disease; LB, liposomal bupivacaine; TSA, total shoulder arthroplasty.

RESULTS

PATIENT CHARACTERISTICS

- The LB and non-LB groups (3223 patients each) were well balanced after matching, with a standardized mean difference of <10% across covariates (Table 1)
- Patients had a mean age of 74 years and a mean Quan-Charlson Comorbidity Index of 2.1; 31% of patients had a history of chronic pain

Table 1. Baseline Characteristics and Characteristics After Propensity Score Matching

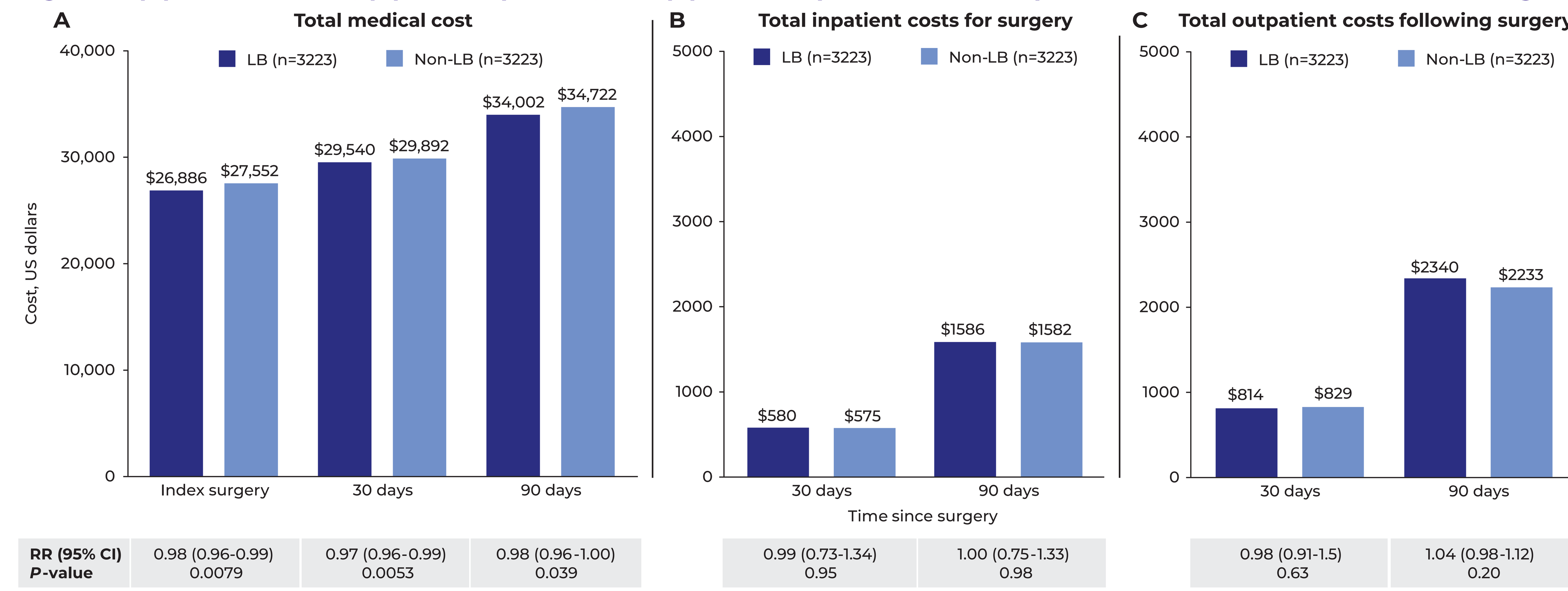
	Before matching			After matching		
	Non-LB (n=3265)	LB (n=3298)	SMD (%)	Non-LB (n=3223)	LB (n=3223)	SMD (%)
Age, mean (SD), y	74.3 (5.97)	74.3 (6.00)	0.07	74.3 (5.96)	74.3 (5.98)	-0.21
Sex, n (%)			4.32			-2.54
Female	1844 (56.5)	1880 (57.0)		1824 (56.6)	1862 (57.8)	
Male	1421 (43.5)	1418 (43.0)		1399 (43.4)	1361 (42.2)	
Race, n (%)			4.39			-2.54
White	2806 (85.9)	2738 (83.0)		2765 (85.8)	2736 (84.9)	
All other	459 (14.1)	56 (17.0)		458 (14.2)	487 (15.1)	
Comorbidities at baseline, n (%)						
Obesity	977 (29.9)	986 (29.9)	-0.06	961 (29.8)	959 (29.8)	-0.14
Smoking	1138 (34.9)	1140 (34.6)	-0.61	1120 (34.8)	1116 (34.6)	-0.26
Dementia	47 (1.4)	45 (1.4)	-0.64	45 (1.4)	42 (1.3)	-0.81
Depression	629 (19.3)	591 (17.9)	-3.46	597 (18.5)	584 (18.1)	-1.04
Anxiety	587 (18.0)	599 (18.2)	0.48	583 (18.1)	594 (18.4)	0.88
Chronic pain	1020 (31.2)	1030 (31.2)	-0.02	1008 (31.3)	1012 (31.4)	0.27
SUD	105 (3.2)	106 (3.2)	-0.01	103 (3.2)	106 (3.3)	0.53
Procedure year, n (%)			4.72			2.51
2021	559 (17.1)	512 (15.5)		524 (16.3)	510 (15.8)	
2022	915 (28.0)	912 (27.7)		910 (28.2)	874 (27.1)	
2023	1187 (36.4)	1254 (38.0)		1185 (36.8)	1237 (38.4)	
2024	604 (18.5)	620 (18.8)		604 (18.7)	602 (18.7)	
Quan-CCI score			-1.50			-2.46
Mean (SD)	2.1 (2.63)	2.1 (2.56)		2.1 (2.63)	2.1 (2.55)	

CCI, Charlson Comorbidity Index; LB, liposomal bupivacaine; SD, standard deviation; SMD, standardized mean difference; SUD, substance use disorder.

TSA HEALTHCARE COSTS

- Compared with non-LB analgesia, LB analgesia was associated with significantly lower any-cause total medical costs (Figure 2A)
  - $666 lower cost for the index surgery (rate ratio, 0.98 [95% confidence interval (CI), 0.96-0.99]; $P<0.01$)
  - $352 lower cost at 30 days of follow-up (rate ratio, 0.97 [95% CI, 0.96-0.99]; $P<0.01$)
  - $720 lower cost at 90 days of follow-up (rate ratio, 0.98 [95% CI, 0.96-1.00]; $P<0.05$)
- Total inpatient and outpatient medical costs were not statistically different between the LB and non-LB groups at 30 and 90 days of follow-up (Figure 2B and 2C, respectively)

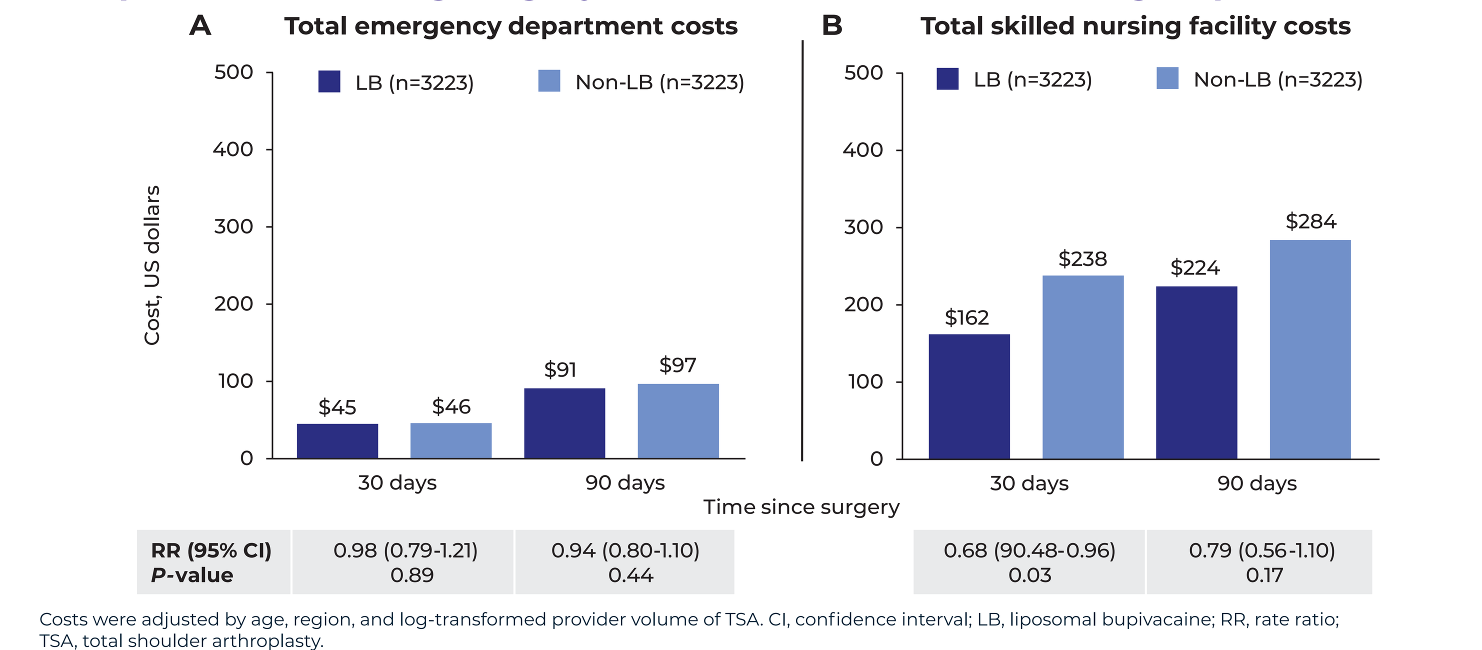
Figure 2. (A) Total medical, (B) total inpatient, and (C) total outpatient cost comparisons between the LB and non-LB groups.



Costs were adjusted by age, region, and log-transformed provider volume of TSA. CI, confidence interval; LB, liposomal bupivacaine; RR, rate ratio; TSA, total shoulder arthroplasty.

- Total emergency department medical costs were comparable between the LB and non-LB groups at 30 and 90 days of follow-up (Figure 3A)
- Compared with non-LB analgesia, LB analgesia was associated with $76 lower total SNF medical costs at 30 days following surgery ($P<0.05$; Figure 3B)
- Total SNF costs were comparable between the LB and non-LB groups at 90 days following surgery

Figure 3. Total emergency department and skilled nursing facility cost comparisons following surgery between the LB and non-LB groups.

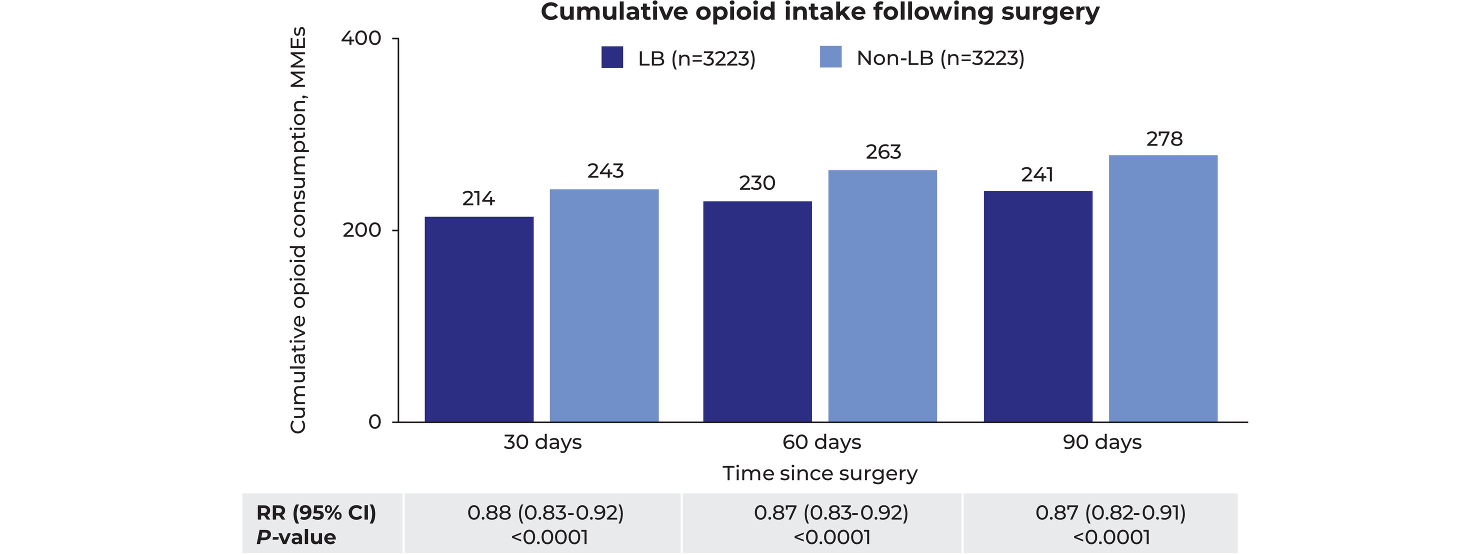


Costs were adjusted by age, region, and log-transformed provider volume of TSA. CI, confidence interval; LB, liposomal bupivacaine; RR, rate ratio; TSA, total shoulder arthroplasty.

INTAKE OF OPIOIDS AND OPIOID-RELATED ADVERSE EVENTS FOLLOWING SURGERY

- Patients receiving LB versus non-LB analgesia consumed significantly fewer MMEs after surgery (Figure 4)
  - 29 fewer MMEs over 30 days of follow-up (rate ratio, 0.88 [95% CI, 0.83-0.92]; $P<0.0001$)
  - 32 fewer MMEs over 60 days of follow-up (rate ratio, 0.87 [95% CI, 0.82-0.91]; $P<0.0001$)
  - 37 fewer MMEs over 90 days of follow-up (rate ratio, 0.87 [95% CI, 0.82-0.91]; $P<0.0001$)

Figure 4. Cumulative opioid consumption comparisons between the LB and non-LB cohorts.



Opioid free treated as 0. Opioid costs adjusted by age, region, and log-transformed provider volume of TSA. CI, confidence interval; LB, liposomal bupivacaine; MME, morphine milligram equivalent; RR, rate ratio; TSA, total shoulder arthroplasty.

- The proportion of patients experiencing an ORAE was comparable between the groups at 30 days following surgery (Table 2)
- However, the LB group had significantly lower probability of experiencing an ORAE than the non-LB group at 60 and 90 days following surgery ($P<0.05$ for both)

Table 2. Opioid-Related Adverse Events Following Surgery

	n (% event)	Odds ratio[a] (95% CI)	*P*-value
30 days		0.938 (0.668-1.317)	0.71
LB	67 (2.1)		
Non-LB	71 (2.2)		
60 days		0.762 (0.586-0.993)	0.04
LB	102 (3.2)		
Non-LB	133 (4.1)		
90 days		0.757 (0.602-0.953)	0.017
LB	137 (4.3)		
Non-LB	178 (5.5)		

[a]Adjusted for age, region, and log-transformed provider volume of TSA. CI, confidence interval; LB, liposomal bupivacaine; TSA, total shoulder arthroplasty.